GENI:
Global Environment for Networking Innovations

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The Future of the Internet
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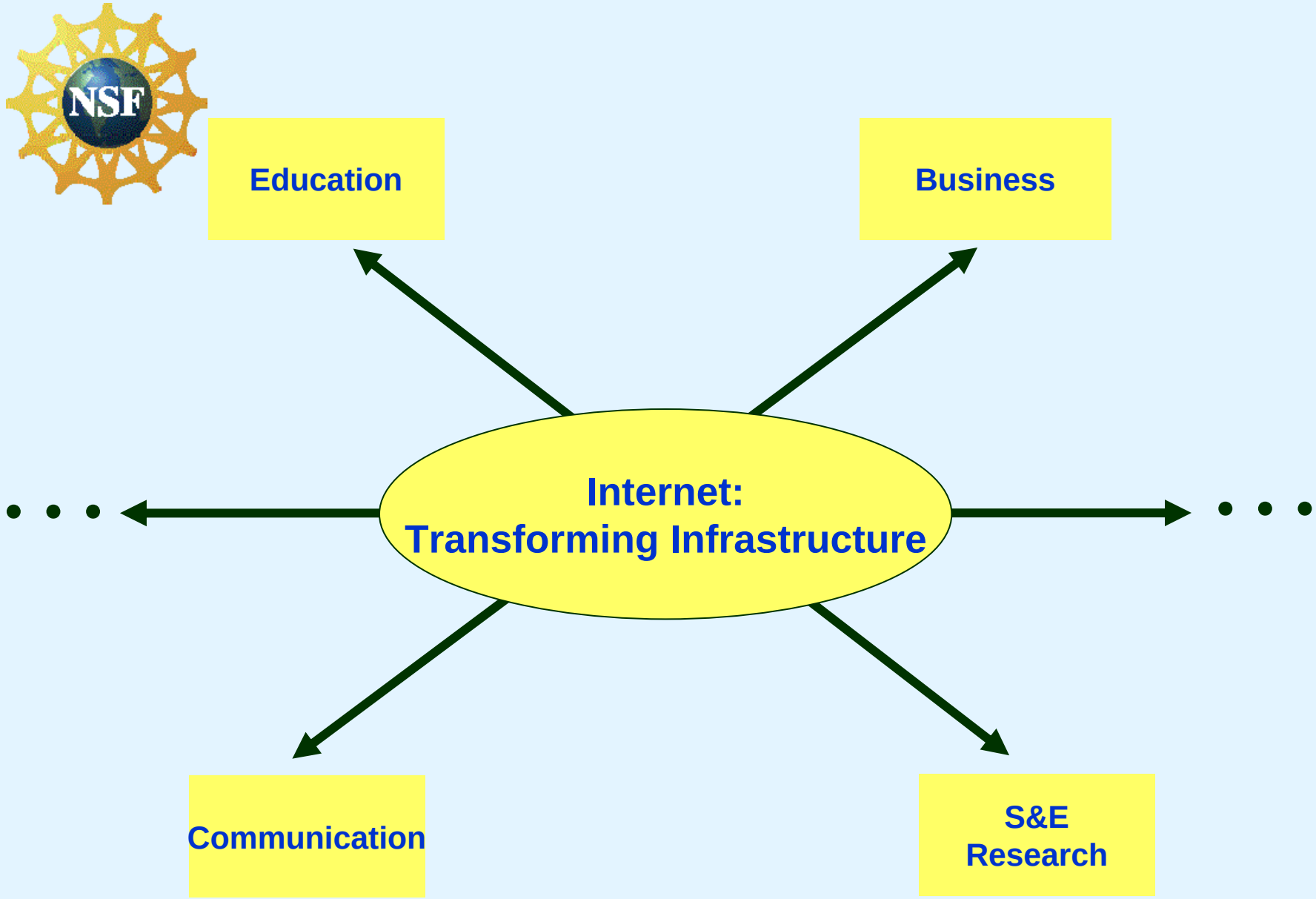
Outline

- What are the Current Challenges?
- What is the US Approach?
- The Future (as we see it today)


Education
Business
Internet:
Transforming Infrastructure
Communication
S&E
Research

Challenges

- Increasing dependence of society on the Internet
- Fundamental limitations of current Internet architecture
  - Security, robustness, manageability, quality of service, etc.
  - At the limit of its extensibility
- New opportunities enabled by
  - Disruptive technologies: sensors, mobile wireless, photonics…
  - New classes of applications in all areas of activity
- Need to establish robust, experimental, scientifically validated methodologies for network and distributed systems research

Transportation

Critical Infrastructure

Internet Not Ready for Its Future Roles

Telecommunications

Banking & Finance

US Approach to the Challenges

- Our response is:
  - Serious experimentation at scale with new architectures, technologies, and policies
  - The GENI project, which envisions and implements this experiment

GENI Vision & Implementation

- Build future networks/systems based on a more solid scientific basis so that they can overcome current limitations and accelerate innovations
- Enable the discovery and evaluation of *revolutionary* new ideas, paradigms, and technologies that will serve as the basis for the Internet of the 21st century and create an engine for economic growth
- Build a shared facility that will support exploration and evaluation of new network architectures

GENI Vision & Implementation (2)

A shared facility that allows:

- Concurrent exploration of a broad range of experimental networks and distributed services
- Interconnection among these experimental networks and with the Internet
- Real users utilizing experimental services
- Observation, measurement, and recording of the resulting experimental outcomes

Example Research Challenges

Security and Robustness	Pervasive Computing w/ Mobility	Bridging Physical and Cyberspace	Autonomic Networking
Impact: Trustworthy & reliable information access	**Impact:** Seamless information access any where and any time	**Impact:** Access information about physical world in real time	**Impact:** Information access in dynamic and challenging environments

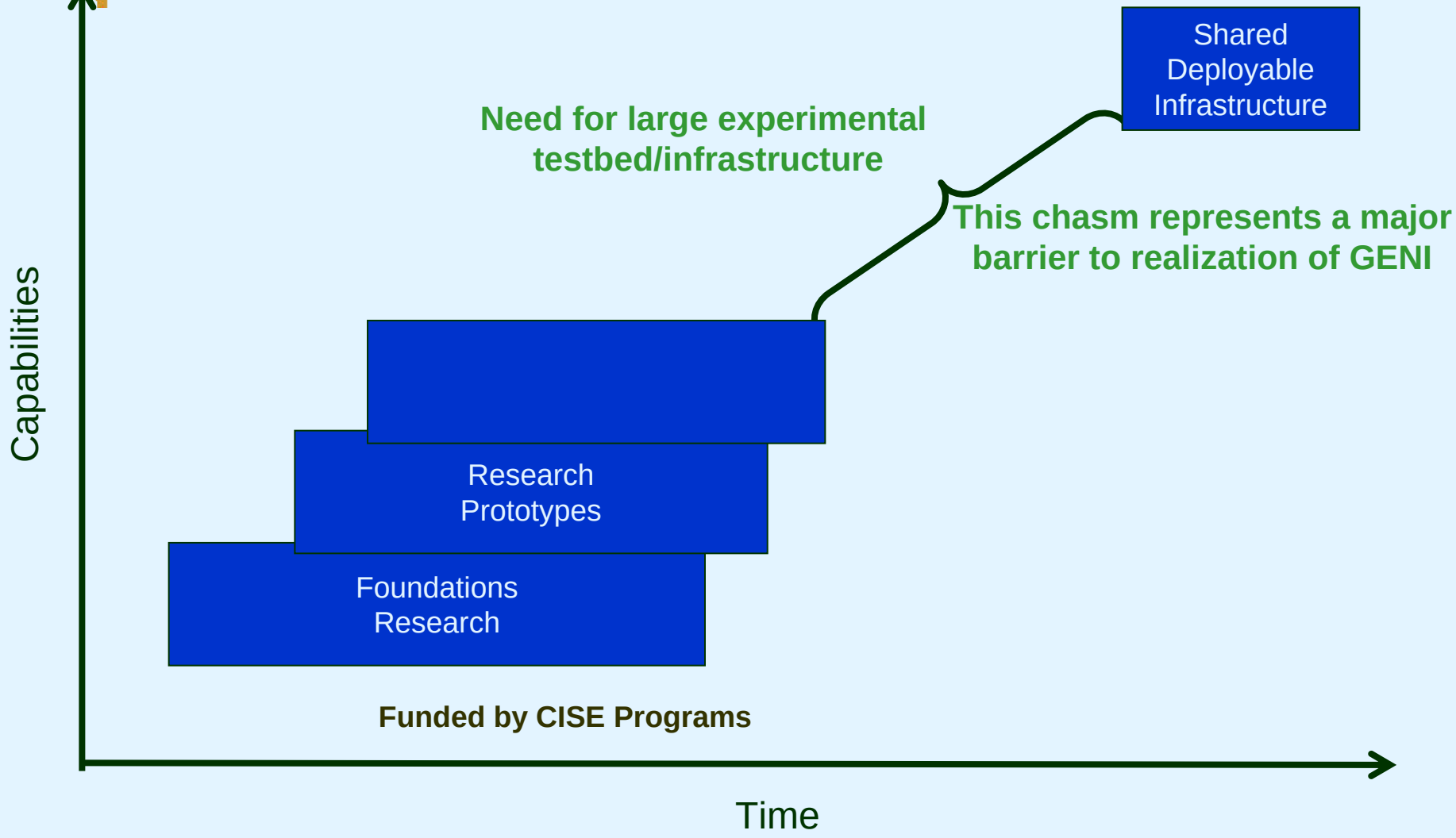
GENI-enabled research

Scope of Research

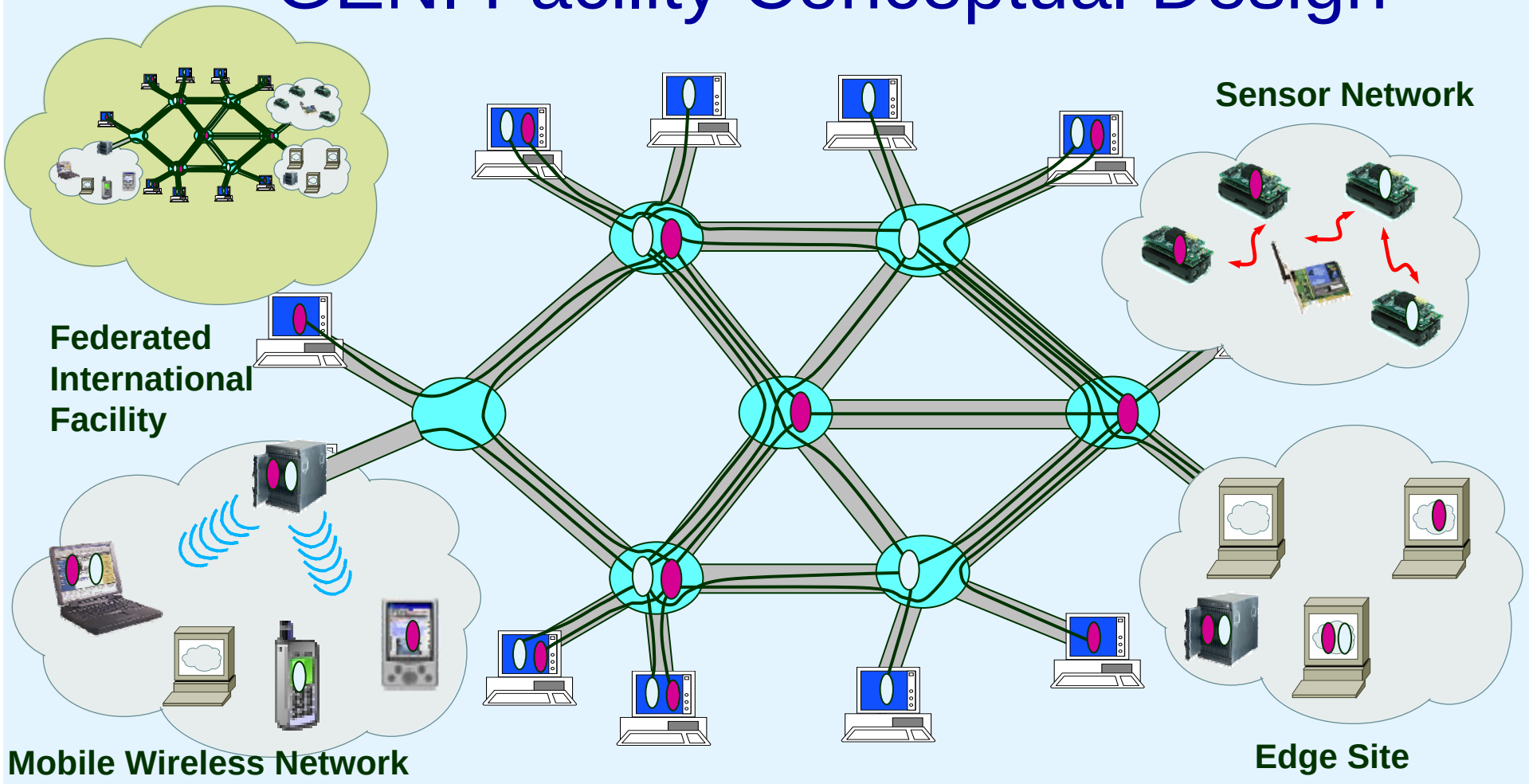
- Core mechanisms
- Theoretical foundations
- Security and robustness
- Privacy and accountability
- Manageability and usability
- Economic viability
- Communications during crises
- High-level conceptualization
- Support for applications design
- Large-scale storage management
- Social needs

Networking and distributed systems broadly defined

Case for GENI

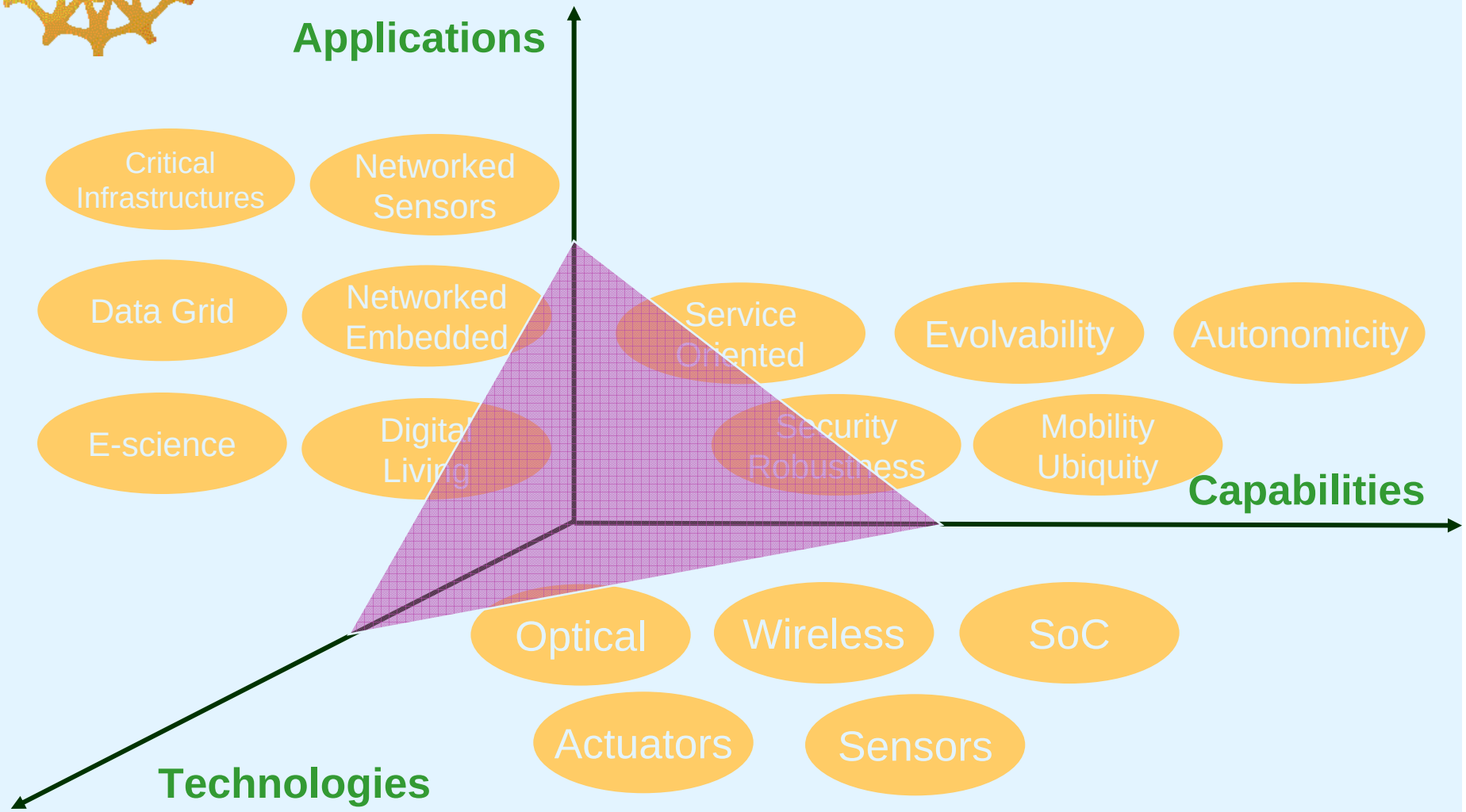


GENI Facility Conceptual Design



Slicing, Virtualization, Programmability

Looking Ahead



International Partnerships are Important

- Help define facility scope
- Build national partner facilities to complement US GENI facilities and capabilities
- Share facilities with researchers in all partner countries
- Encourage collaborative international research projects and experiments

Industry Partnerships are Important

- Help to refine R&D objectives
- Become a member in the GENI consortium
- Provide leading-edge technology for use in GENI
- Contract (or subcontract) to build the facility
- Conduct collaborative research with universities
- Benefits to partnering
  - Accelerate the transfer of academic research results to commercial products
  - Enable a national/international “proving ground” for new technology

Conclusions

- The future of the Internet is too important to be left to chance or random developments.
- True experimentation is needed.
- The GENI project intends to provide the basic architectures, technologies, and policies that will be needed for successful networking in the 2010-2020 time frame.

Contact Information

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Visit the GENI web site at:
http://www.nsf.gov/cise/geni/
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